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## 14 Reference Information

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### 14-1 Technical Terms

- **TFT-LCD**  
(Thin film Transistor Liquid Crystal Display)  
ADC(Analog to Digital Converter)  
This is a circuit that converts from analog signal to digital signals.
- **PLL(Phase Locked Loop)**  
During progressing ADC, Device makes clock synchronizing HSYNC with Video clock
- **Inverter**  
Device that supply Power to LCD panel lamp.  
this device generate about 1,500~2,000V.
- **AC Adapter**  
Device that converts AC(90V~240V) to DC (+12V or 14V)
- **SMPS(Switching Mode Power Supply)**  
Switching Mode Power supply. This design technology is used to step up/down the input power by switching on/off
- **FRC(Frame Rate Controller)**  
Technology that change image frame quantity displayed on screen for one second.  
Actually TFT-LCD panel require 60 pcs of frame for one second. so, this technology is needed to convert input image to 60 pcs regardless input frame quantity.
- **Image Scaler**  
Technology that convert various input resolution to other resolution.(ex. 640\* 480 to 1024\*768)
- **Auto Configuration(Auto adjustment)**  
This is an algorithm to adjust monitor to optimum condition by pushing one key.
- **OSD(On Screen Display)**  
On screen display. customer can control the screen easily with this.
- **Image Lock**  
This means "Fineness adjustment" in LCD Monitor, the features are "Fine" and "Coarse".
- **FINE**  
"Fine" adjustment is used to adjust visibility by control phase difference.
- **COARSE**  
This is a adjustment by tuning with Video clock and PLL clock.
- **DVI (Digital Visual Interface)**  
This provides a high speed digital connection for visual data types that is display technology independent. this interface is primarily focused at providing a connection between a computer and its display device.
- **L.V.D.S.(Low Voltage Differential Signaling)**  
A kind of transmission method for Digital. It can be used from Main PBA to Panel.
- **HDMI(high definition multimedia interface)**  
Superhigh speed multimedia interface that can incorporate grass digital audio and video signal that is not compressed and transmit. By standard that replace existent composite, supermarket video, analog interface with component video, is applied mainly to newly developed DVD player, HDTV, set top box etc..circuits is simple by handling as it is without compressing digital video and audio of 5Gbps degrees, and degradation of quality does not happen, and protection of contents mastication by HDCP ( High-bandwidth Digital Content Protection ) is supported, and there is advantage that single cable link use is simple. Transposition is available with digital visual interface (DVI) used mainly in computer industry through CEA-861 profile analysis for DTV. American Institute of Electrical and Electronic Engineering (IEEE) proposed first and participate in some dying injunction electronic company, broadcasting industry, movie studio.

- **T.M.D.S**

(Transition minimized Differential Signaling)  
a kind of transmission method for Digital.  
It can be used from Video card to Main PBA.

- **DDC(Display data channel)**

It is a communication method between Host  
Computer and related equipment.  
It can make it Plug and Play between PC and  
Monitor.

- **EDID**

Extended Display Identification Data PC can  
recognize the monitor information as Product  
data, Product name, Display mode, Serial  
number and Signal source, etc through DDC  
Line communicating with PC and Monitor.

- **Dot Pitch**

The image on a monitor is composed of red,  
green and blue dots. The closer the dots, the  
higher the resolution. The distance between two  
dots of the same color is called the 'Dot Pitch'.  
Unit: mm

- **Vertical Frequency**

The screen must be redrawn several times per  
second in order to create and display an image  
for the user. The frequency of this repetition per  
second is called Vertical Frequency or Refresh  
Rate. Unit: Hz  
Example: If the same light repeats itself 60 times  
per second, this is regarded as 60 Hz.

- **Horizontal Frequency**

The time to scan one line connecting the right  
edge to the left edge of the screen horizontally is  
called Horizontal Cycle. The inverse number of  
the Horizontal Cycle is called Horizontal  
Frequency. Unit: kHz

- **Interlace and Non-Interlace Methods**

Showing the horizontal lines of the screen from  
the top to the bottom in order is called the  
Non-Interlace method while showing odd lines  
and then even lines in turn is called the Interlace  
method. The Non-Interlace method is used for the  
majority of monitors to ensure a clear image.  
The Interlace method is the same as that  
used in TVs.

- **Plug & Play**

This is a function that provides the best quality  
screen for the user by allowing the computer  
and the monitor to exchange information  
automatically. This monitor follows the  
international standard VESA DDC for the  
Plug & Play function.

- **Resolution**

The number of horizontal and vertical dots used  
to compose the screen image is called 'resolution'.  
This number shows the accuracy of the display.  
High resolution is good for performing multiple  
tasks as more image information can be shown  
on the screen.

**Example:** If the resolution is 1280 x 1024, this  
means the screen is composed of 1280 horizontal  
dots (horizontal resolution) and 1024 vertical lines  
(vertical resolution).

- **BTSC**

Broadcast Television System Committee The  
stereo broadcasting system that is used in most  
of the countries that have adopted the NTSC  
system, including the United States, Canada,  
Chile, Venezuela and Taiwan. It also refers to the  
organization that has been organized to promote  
its development and management.

- **EIAJ**

Electronic Industries Association of Japan.

- **RF Cable**

A round signal cable generally used for TV  
antennas.

- **Satellite Broadcasting**

Broadcasting service provided via satellite.  
Enables high picture quality and clear sound  
throughout the country regardless of the location  
of the viewer.

- **Sound Balance**

Balances the levels of the sound coming from  
each speaker in televisions with two speakers.

**- Cable TV**

Whereas the terrestrial broadcasting is delivered via frequency signals through the air, cable broadcasting is transmitted via a cable network. In order to view cable TV, one must purchase a cable receiver and hook it up to the cable network.

**- CATV**

"CATV" refers to the broadcasting service offered at hotels, schools and other buildings through their own broadcasting system, apart from VHF or UHF broadcasting by terrestrial broadcasters. The CATV programs may include movies, entertainment and educational programs. (Different from cable TV.)

CATV can be viewed only within the area in which the CATV service is offered.

**- S-Video**

Short for "Super Video." S-Video allows up to 800 lines of horizontal resolution, enabling high-quality video.

**- VHF/UHF**

VHF indicates TV channels 2 to 13, and UHF indicates channels 14 through 69.

**- Channel Fine Tuning**

This feature allows the viewer to fine-tune the TV channel to obtain the best viewing conditions. The Samsung LCD TV has both automatic and manual channel fine-tuning features to enable the viewer to adjust their desired settings.

**- External Device Input**

External device input refers to video input from such external video devices as VCRs, camcorders and DVD players, separate from a TV broadcast.

14-2 Pin Assignments

14-2-1 DVI-D

<div>Sync Type</div> <div>Pin No.</div>	24P DVI-D			
1	Rx2-	13	NC	
2	Rx2+	14	DDC Input power (+5V)	
3	GND	15	IDENT-DVI	
4	NC	16	Output Signal (HDCP Control)	
5	NC	17	Rx0-	
6	DDC - SCL	18	Rx0+	
7	DDC - SDA	19	GND	
8	NC	20	NC	
9	Rx1-	21	NC	
10	Rx1+	22	GND	
11	GND	23	RxC+	
12	NC	24	RxC-	

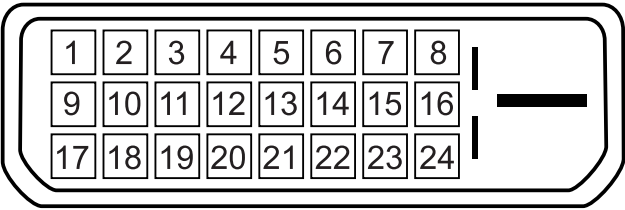


Figure 1.

## 14-2-2 Component 1, 2

RCA Green	Y
	GND
RCA Blue	Pb (Cb)
	GND
RCA Red	Pr (Cr)
	GND
RCA White	Audio L
	GND
RCA Red	Audio R
	GND

## 14-2-4 A/V 1,2

RCA Yellow	CVBS
RCA White	Audio L
	GND
RCA Red	Audio R
	GND

## 14-2-3 S-Video

Pin	Separate
1	GND
2	Y
3	C
4	GND
5	GND

## 14-2-5 D-SUB

Pin	Separate
1	Red
2	Green
3	Blue
4	GND
5	GND
6	GND Red
7	GND Green
8	GND Blue
9	DDC Input power(+5V)
10	IDENT PC
11	GND
12	DDC Data(SDA)
13	H SYNC
14	V SYNC
15	DDC Clock(SCL)

## 14-2-6 PC Display mode

Both screen position and size will vary depending on the type of PC monitor and its resolution.

The resolutions in the table are recommended. (All resolutions between the supported limits are supported)

Mode	Resolution	Horizontal Frequency (kHz)	Vertical Frequency (Hz)	Pixel Clock Frequency (MHz)	Sync Polarity (H/V)
IBM	640 x 480	31.469	59.940	25.175	- / -
	720 x 400	31.469	70.087	28.322	- / +
VESA	640 x 480	37.861	72.809	31.500	- / -
	640 x 480	37.500	75.000	31.500	- / -
	800 x 600	37.879	60.317	40.000	+ / +
	800 x 600	48.077	72.188	50.000	+ / +
	800 x 600	46.875	75.000	49.500	+ / +
	1024 x 768	48.364	60.000	65.000	- / -
	1024 x 768	56.476	70.069	75.000	- / -
	1024 x 768	60.023	75.029	78.750	+ / +
	1360 x 768	47.712	60.015	85.800	+ / +

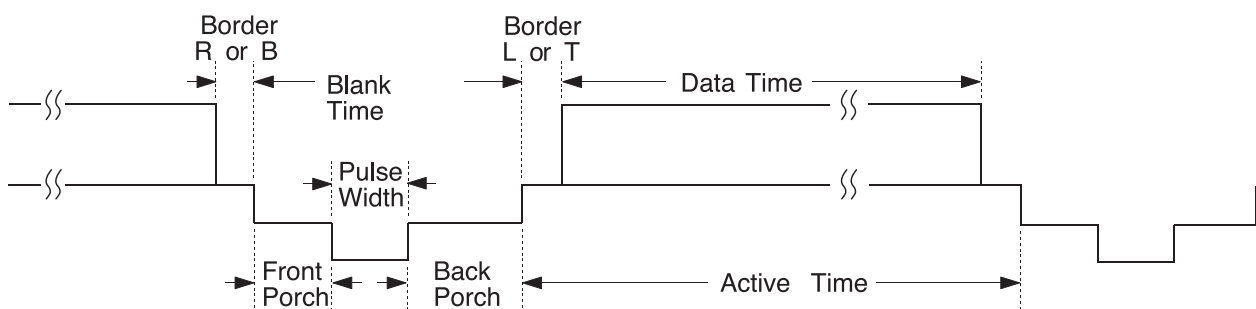
- The interlace mode is not supported.
- The set might operate abnormally if a non-standard video format is selected.
- DVI dose not support PC function.

## 14-3 Timing Chart

This section of the service manual describes the timing that the computer industry recognizes as standard for computer-generated video signals.

### 14-3-1 LCD Panel Mode1 mode

Timing No.	LTA400W2
Originator	VESA
Mode Name	1366/60Hz
Resolution (HxV)	1366x768
HORIZONTAL	
Frequency	47.712kHz
Total time	20.959 $\mu$ s
Active time	15.906 $\mu$ s
Blank time	5.053 $\mu$ s
Border(L / R)	0.000 $\mu$ s
Data time	15.906 $\mu$ s
Front porch	0.749 $\mu$ s
Sync. width	1.702 $\mu$ s
Back porch	2.994 $\mu$ s
Sync. polarity	Positive
VERTICAL	
Frequency	60.015Hz
Total time	16.662 ms
Active time	16.097 ms
Blank time	0.566 ms
Border(T / B)	0.000 ms
Data time	16.097 ms
Front porch	0.063 ms
Sync. width	0.105 ms
Back porch	0.377 ms
Sync polarity	Positive
Dot Clock	85.500MHz
Sync. Type	Separate
Scan Type	N/I



## 14-3-2 Supported Modes (1)

Timing No. Originator Mode Name Resolution (HxV)	2 IBM VGA2 720x400	3 IBM VGA3 640x480	11 VESA 640/72Hz 640x480	17 VESA 640/75Hz 640x480	32 MAC 640/67Hz 640x480
HORIZONTAL Frequency	31.469kHz	31.469kHz	37.861kHz	37.500kHz	35.000kHz
Total time	31.777μs	31.778μs	26.413μs	26.667μs	28.571μs
Activetime	26.058μs	26.058μs	20.825μs	20.317μs	21.164μs
Blank time	5.720μs	5.720μs	5.588μs	6.350μs	7.407μs
Border(L / R)	0.318μs	0.318μs	0.254μs	0.000μs	0.000μs
Data time	25.422μs	25.422μs	20.317μs	20.317μs	21.164μs
Front porch	0.318μs	0.318μs	0.508μs	0.508μs	2.116μs
Sync. width	3.813μs	3.813μs	1.270μs	2.032μs	2.116μs
Back porch	1.589μs	1.589μs	3.810μs	3.810μs	3.175μs
Sync. polarity	Negative	Negative	Negative	Negative	Negative
VERTICAL Frequency	70.087Hz	59.940Hz	72.809Hz	75.000Hz	66.667Hz
Total time	14.268ms	16.683ms	13.735ms	13.333ms	15.000ms
Active time	13.155ms	15.761ms	13.100ms	12.800ms	13.714ms
Blank time	1.113ms	0.922ms	0.635ms	0.533ms	1.286ms
Border(T / B)	0.222ms	0.254ms	0.211ms	0.000ms	0.000ms
Data time	12.711ms	15.253ms	12.678ms	12.800ms	13.714ms
Front porch	0.191ms	0.064ms	0.026ms	0.027ms	0.086ms
Sync. width	0.064ms	0.064ms	0.079ms	0.080ms	0.086ms
Back porch	0.858ms	0.794ms	0.528ms	0.427ms	1.114ms
Sync polarity	Positive	Negative	Negative	Negative	Negative
Dot Clock	28.322MHz	25.175MHz	31.500MHz	31.500MHz	30.240MHz
Sync. Type	Separate	Separate	Separate	Separate	Separate
Scan Type	N/I	N/I	N/I	N/I	N/I

## 14-3-3 Supported Modes (2)

Timing No. Originator Mode Name Resolution (HxV)	13 VESA 800/60Hz 800x600	14 VESA 800/72Hz 800x600	18 VESA 800/75Hz 800x600
HORIZONTAL Frequency Total time Active time Blank time Border(L / R) Data time Front porch Sync. width Back porch Sync. polarity	37.879kHz 26.400 $\mu$ s 20.000 $\mu$ s 6.400 $\mu$ s 0.000 $\mu$ s 20.000 $\mu$ s 1.000 $\mu$ s 3.200 $\mu$ s 2.200 $\mu$ s Positive	48.077kHz 20.800 $\mu$ s 16.000 $\mu$ s 4.800 $\mu$ s 0.000 $\mu$ s 16.000 $\mu$ s 1.120 $\mu$ s 2.400 $\mu$ s 1.280 $\mu$ s Positive	46.875kHz 21.333 $\mu$ s 16.162 $\mu$ s 5.171 $\mu$ s 0.000 $\mu$ s 16.162 $\mu$ s 0.323 $\mu$ s 1.616 $\mu$ s 3.232 $\mu$ s Positive
VERTICAL Frequency Total time Active time Blank time Border(T / B) Data time Front porch Sync. width Back porch Sync polarity	60.317Hz 16.579ms 15.840ms 0.739ms 0.000ms 15.840ms 0.026ms 0.106ms 0.607ms Positive	72.188Hz 13.853ms 12.480ms 1.373ms 0.000ms 12.480ms 0.770ms 0.125ms 0.478ms Positive	75.000Hz 13.333ms 12.800ms 0.533ms 0.000ms 12.800ms 0.021ms 0.064ms 0.448ms Positive
Dot Clock	40.000MHz	50.000MHz	49.500MHz
Sync. Type	Separate	Separate	Separate
Scan Type	N/I	N/I	N/I



## 14-3-4 Supported Modes (3)

Timing No. Originator Mode Name Resolution (HxV)	15 VESA 1024/60Hz 1024x768	16 VESA 1024/70Hz 1024x768	19 VESA 1024/75Hz 1024x768	VESA 1360/60Hz 1360x768
HORIZONTAL Frequency Total time Activetime Blank time Border(L / R) Data time Front porch Sync. width Back porch Sync. polarity	48.363kHz 20.677 $\mu$ s 15.754 $\mu$ s 4.923 $\mu$ s 0.000 $\mu$ s 15.754 $\mu$ s 0.369 $\mu$ s 2.092 $\mu$ s 2.462 $\mu$ s Negative	56.476kHz 17.707 $\mu$ s 13.653 $\mu$ s 4.053 $\mu$ s 0.000 $\mu$ s 13.653 $\mu$ s 0.320 $\mu$ s 1.813 $\mu$ s 1.920 $\mu$ s Negative	60.023kHz 16.660 $\mu$ s 13.003 $\mu$ s 3.777 $\mu$ s 0.000 $\mu$ s 13.003 $\mu$ s 0.323 $\mu$ s 1.219 $\mu$ s 2.235 $\mu$ s Positive	47.712kHz 20.959 $\mu$ s 15.906 $\mu$ s 5.053 $\mu$ s 0.000 $\mu$ s 15.906 $\mu$ s 0.749 $\mu$ s 1.702 $\mu$ s 2.994 $\mu$ s Positive
VERTICAL Frequency Total time Active time Blank time Border(T / B) Data time Front porch Sync. width Back porch Sync polarity	60.004Hz 16.666ms 15.880ms 0.786ms 0.000ms 15.880ms 0.062ms 0.124ms 0.600ms Negative	70.069Hz 14.272ms 13.599ms 0.672ms 0.000ms 13.599ms 0.053ms 0.106ms 0.513ms Negative	75.029Hz 13.328ms 12.795ms 0.533ms 0.000ms 12.795ms 0.017ms 0.050ms 0.466ms Positive	60.015Hz 16.662ms 16.097ms 0.566ms 0.000ms 16.097ms 0.063ms 0.105ms 0.377ms Positive
Dot Clock	65.000MHz	75.000MHz	78.750MHz	85.500MHz
Sync. Type	Separate	Separate	Separate	Separate
Scan Type	N/I	N/I	N/I	N/I

## Memo